Nature Notes

By Marjorie Richman

Marvelous Migrators

They are different. To the untrained eye they might look the same, orange wings with black markings, but appearance turns out to be the only criterion they share with other members of their species. They even come into the world at different times from their closest cousins, late in the year with winter just around the corner. They aren't interested in normal butterfly behavior, mating and flitting randomly from flower to flower. These monarchs are on a mission, they must save their energy for a long trip, from North America to Mexico where they will overwinter. Their trip is dangerous. They must navigate to a place they have never been, flying over large expanses of land and water through all types of weather. Many don't make it. It is one of the most daring migrations on the planet.

Monarch butterflies – Photo by Marjorie Richman

Sometime in the mid-1800s people in North America began noticing swarms of butterflies flying in a southerly direction in the fall. There were so many that it sometimes took several hours for the sky to clear. It was obviously a migration of some sort, but where were they going? By the mid-20th century, Fred Urquhart, a Canadian zoologist, and his wife, Norah, decided to take an organized approach to resolving the mystery. They founded an organization devoted to insect migrations (now the Monarch Watch) and recruited volunteers via citizen scientist programs to tag monarchs and report sightings. Thousands of insects were tagged, a very delicate operation on such fragile creatures. For years the volunteers reported sightings and the Urquharts used a map and pins to keep track of the locations. All paths led to Texas, but no gathering place could be found. Urquhart believed the monarchs must be traveling further, into Mexico, but it was hard to believe that such a small creature, weighing less than a gram with a brain the size of the head of a pin, could possibly undertake such a journey.

Urquhart recruited Mexican volunteers to look for an overwintering location. In January, 1975, the first site was found in the mountainous regions of Michoacan, Mexico. According to the volunteers, millions of butterflies were roosting in the trees. Yet people were still reluctant to accept the idea that butterflies could survive a trip of about 2500 miles. Perhaps these roosting monarchs were actually resident butterflies. Proof was needed to determine where the monarchs came from. A year later the Urquharts went to Michoacan to see the site, and the story sounds like the ending of a Hollywood movie: just by chance, among the millions of butterflies at the site, they found a butterfly that had been tagged in North America. Fortunately, there were plenty of witnesses, a National Geographic crew was with them when the tagged monarch was found. It was finally a proven fact that tiny monarch butterflies in huge numbers fly to the mountains of Mexico to spend the winter.

Finding the overwintering site only led to more questions. How do they do it and why? We still don't have all the answers, but much knowledge has been gained since 1975. We have learned that insects use the sun as a navigational tool. We also now understand the workings of circannual rhythms that all of us, including butterflies, respond to. We have circadian rhythms (24-hour cycles) and circannual rhythms that allow us to prepare for environmental changes during the year before they occur. Monarchs that emerge from their chrysalises in the fall seem to know that survival depends on migrating to a place with a different climate.

Only the 4th generation of a monarch's immediate ancestors makes the trip. They emerge from their chrysalises in late August or early September. They are larger

than their ancestors, stronger and more richly colored. Their wings have a fuller shape which allows them to take advantage of wind currents. Whereas most butterflies fly in short spurts, migrating monarchs are able to soar to save energy. There are also significant behavioral differences between migrating and non-migrating monarchs. Migrating monarchs do not waste their energy chasing members of the opposite sex and laying eggs. They are focused on getting ready for their long trip. They eat prodigious amounts of nectar and are very social. Unlike non-migrating butterflies, these monarchs will spend time roosting with other monarchs in trees along the way to Mexico. Roosting together in close groups is what they do in Mexico presumably to keep warm. This gregariousness seems to be an innate behavior which is not shared with non-migrators.

Most importantly these monarchs are focused and determined. They are born to travel. In fact, they only want to fly in a south westerly direction, at least from where we are in North America. Several researchers at the University of Massachusetts conducted a series of experiments to see if these monarchs could be fooled to flying north from Massachusetts instead of south. Not so, as it turned out. They were put into a dark barrel, oriented backwards and tethered to keep them from flying either up or down. As soon as they were released, the determined little insects turned southwest and kept going. Nothing interfered with their mission.

And what a journey it is from eastern North America. The monarchs rest along the way, especially before significant water crossings which are thought to be the most dangerous part of the trip. This gives researchers the opportunity to monitor the route and tag the monarchs at key rest stops, such as Cape May, N.J., the Chincoteague National Wildlife Refuge in Chincoteague, Va. and Cape Charles, Va. Monarchs are given tiny tags attached to their wings and then released. The tag has a number that identifies the location and date so that volunteers can report sightings as the journey continues. This method has allowed researchers to estimate how many monarchs start the journey and how many arrive. As you can imagine, the mortality rate is quite high.

In Mexico, the monarchs cluster together and are mainly dormant, leaving the roost only to drink moisture from the dew on the ground. When flowers begin to bloom, they fill up on nectar after the long fast. When it's time to go, once again the sky is darkened with millions of insects as far as one can see. The monarchs fly to Texas, mate, and die. The 2nd generation continues the trip and the cycle continues.

In an effort to get relief from days hibernating due to the pandemic, I drove to the Chincoteague Wildlife refuge in October 2020. While bicycling in the refuge, I saw a number of very colorful monarch butterflies drinking nectar from goldenrod plants that were growing along a section of wetlands. They must have been several weeks old, but they looked as if they had just popped out of their chrysalises. I watched them for several minutes and was amazed at their energy. I knew I was seeing migrating monarchs fueling up for the next leg of the journey. They were moving so fast it was hard to get a picture, especially of two butterflies on the same plant.

Add looking for monarchs to your list of things to do in the fall. Monarchs can be found anywhere milkweed grows, as it is only on milkweed that monarchs lay their eggs. The caterpillar remains on the milkweed plant, eating an enormous amount of leaves for about 2 weeks. When it is ready to shed its final layer of skin, it crawls away from the plant to find a substantial branch that will support its chrysalis, an almost jewel like structure consisting of a green casing decorated with gold specs. After about two weeks the butterfly will emerge and hang upside down for about two hours while the wings dry before taking flight. This is a time of vulnerability. Monarchs are poisonous to birds, but insects tolerate them quite well and are on the lookout for defenseless butterflies.

Unfortunately, monarch numbers have diminished considerably in recent years through habitat destruction along the migration route in the United States and at the overwintering sites in Mexico. Climate change is a future threat. The colonies in Mexico already roost near the tops of mountains; they have nowhere to go as the planet warms. Monarch population estimates for the winter of 2021 are approximately 45 million butterflies, down from about 250 million 25 years ago.

Monarchs have been planetary residents for about 1.5 million years. During that time they have successfully adapted to varying environmental conditions. Today the environment is changing rapidly, and it is a question whether any species can adapt fast enough. We can help the monarchs by planting milkweed in our gardens and volunteering for citizen science projects.